

# Calculus Warm Up #9-1

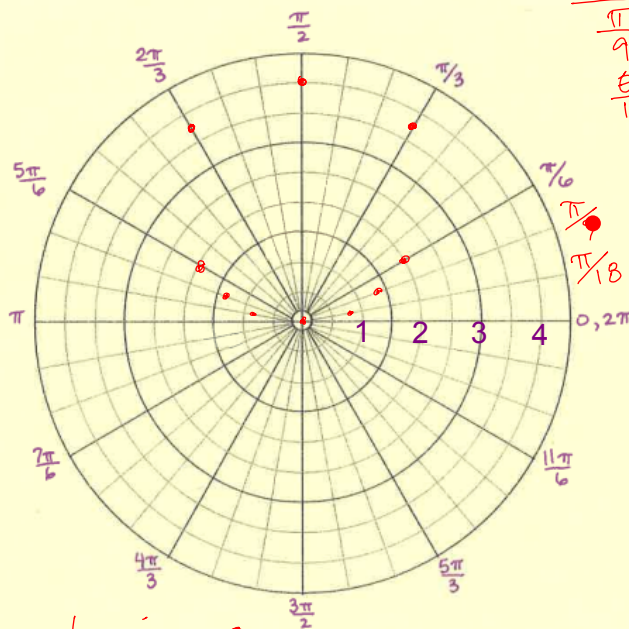
No warm up

Polar Graphing  
Classwork:

Name \_\_\_\_\_

$$r = 4 \sin \theta$$

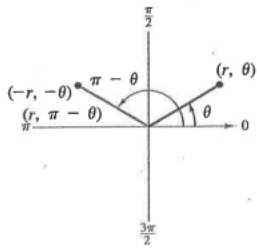
$\theta$	$r$
0	0
$\frac{\pi}{6}$	2
$\frac{\pi}{3}$	$2\sqrt{3} \approx 3.5$
$\frac{\pi}{2}$	4
$\frac{2\pi}{3}$	3.5
$\frac{5\pi}{6}$	2
$\pi$	0
$\frac{7\pi}{6}$	-2
$\frac{4\pi}{3}$	
$\frac{3\pi}{2}$	
$\frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
$2\pi$	



$\theta$	$r$
$\frac{\pi}{9}$	1.4
$\frac{\pi}{18}$	0.7

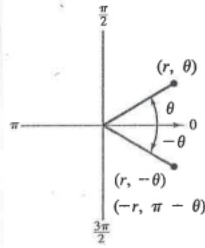
Symmetry in  $\theta = \frac{\pi}{2}$

*Tests for symmetry:* check if the indicated substitution produces an equivalent equation.



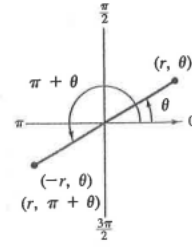
Symmetry with respect to the line  $\theta = \pi/2$

Replace  $(r, \theta)$   
with:  
 $(r, \pi - \theta)$  or  $(-r, -\theta)$



Symmetry with respect to the polar axis

Replace  $(r, \theta)$   
with:  
 $(r, -\theta)$  or  $(-r, \pi - \theta)$



Symmetry with respect to the pole

Replace  $(r, \theta)$   
with:  
 $(r, \pi + \theta)$  or  $(-r, \theta)$

Testing for symmetry:

$$r = 4 \sin \theta$$

$$\text{for } \theta = \frac{\pi}{2}$$

replace  $(r, \theta)$  with:  $(-r, -\theta)$

$$-r = 4 \sin(-\theta)$$

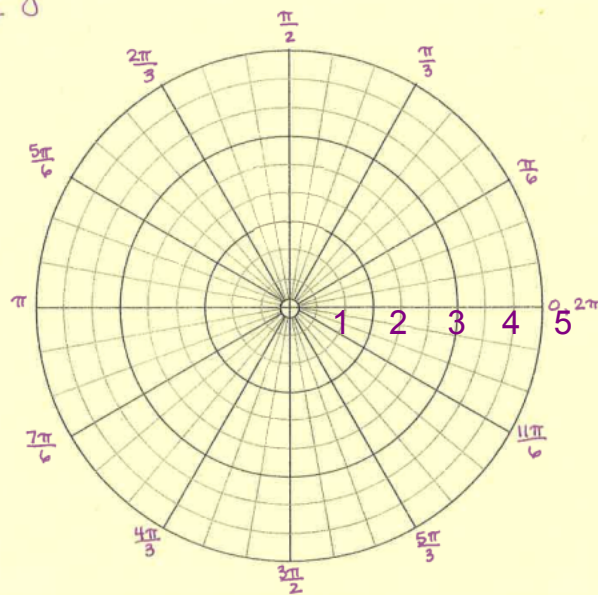
Equivalent results?

$-\theta$	$0$	$-\frac{\pi}{6}$	$-\frac{\pi}{3}$	$-\frac{\pi}{2}$
$-r = 4 \sin(-\theta)$	$0$			

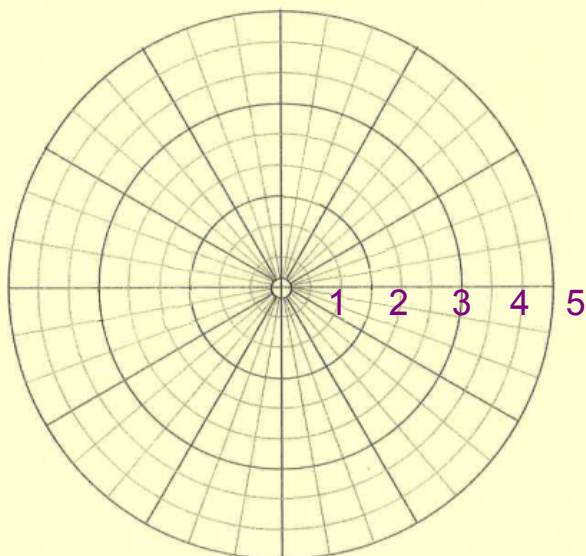
$\theta$	$r$
$0$	$0$
$\frac{\pi}{6}$	$2$
$\frac{\pi}{3}$	$2\sqrt{3}$
$\frac{2\pi}{3}$	$4$
$\frac{5\pi}{6}$	$2\sqrt{3}$
$\pi$	$0$
$\frac{7\pi}{6}$	$-2$
$\frac{4\pi}{3}$	$-2\sqrt{3}$
$\frac{3\pi}{2}$	$-4$
$\frac{5\pi}{3}$	$-2\sqrt{3}$
$\frac{11\pi}{6}$	$-2$
$2\pi$	$0$

$$r = 3 + 2\cos\theta$$

Test for symmetry  
then adjust your  
table of values,  
use symmetry  
to get the rest.



$$r = 2 - 3\sin\theta$$



HW: Polar graph by hand.  
(white WS)